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# (54) PROCESS FOR MANUFACTURE OF REDUCED FAT CHOCOLATE

VERFAHREN ZUR HERSTELLUNG VON FETTARMER SCHOKOLADE

PROCEDE POUR FABRIQUER DU CHOCOLAT A TENEUR REDUITE EN MATIERES GRASSES

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## Description

### Technical Field of the Invention

**[0001]** This invention relates to a process for the manufacture of reduced fat chocolate.

**[0002]** Chocolate is a food with high fat and high energy contents. Milk chocolate, for example, has a fat content varying widely in the range of 27 to 40 % by weight, but more typically contains about 31% by weight of fat and has an assimilable total energy content of about 530 kcal/100g of which the fat content provides more than 50 %. Internationally accepted nutritional guidelines propose that fat should provide no more than 30% to 35% energy.

**[0003]** In good quality chocolate, there is a continuous fat phase which coats all the solid particles and fills the voids between them. In theory, reduction in the fat content of chocolate can be simply achieved by reducing the amount of fat ingredients (such as cocoa butter or milk fat) or of fat-containing ingredients (such as cocoa liquor, milk powder or hazelnut) to be mixed with other chocolate-making ingredients to form the chocolate composition. There are, however, technical restraints on fat reduction in chocolate compositions. Chocolate compositions need to be processed in liquid form. Because the continuous liquid phase of such chocolate compositions is the fat phase, the lower the fat content, the more the viscosity increases, thus making it increasingly difficult to process. One of the important processing steps for making chocolate is a flavour-developing step which is traditionally referred to as "conching".

**[0004]** Traditional conching is a time consuming step and alternative flavour-developing steps can be used which involve intimate mixing or kneading of the liquid chocolate ingredients. As the fat content is reduced, the conching or other flavour-developing step becomes increasingly difficult, resulting in less flavour development. Additionally, the reduction in fat available to coat the ingredients, notably sugar, leads to chocolate of inferior mouthfeel.

### Description of the Prior Art

**[0005]** One way of overcoming this problem in the manufacture of chocolate compositions having a reduced fat-derived energy content is to substitute the cocoa butter and/or other metabolisable fat content of the chocolate by partially or wholly non-metabolisable fats. This is disclosed, for example, in EP-A-0285187, EP-A-0285187 and EP-A-0495553. This enables the fat content to be maintained at a level sufficient to permit processing. However, the use of certain of these non-metabolisable fats in chocolate can lead to anal leakage which is likely to limit acceptability by consumers. The effective calorific content of partially or wholly non-metabolisable fats within the body is uncertain.

**[0006]** Other ways of reducing the fat-derived energy content of chocolate involve initial formulation of chocolate having a low fat content wherein the particle size of the solid particles, particularly the sugar particles, is controlled so as to avoid as far as possible the presence of ultrafine particles. These ultrafine particles require large amounts of fat to coat them and thus cause an increase in the viscosity, thereby making processing difficult. Thus, in the case of milk chocolate, it is known that at least about 50% of the surface area of the particles in milk chocolate is produced by the presence of particles below 2$\mu$m in size. Various proposals have been made for removal of ultrafine particles. US Patent 5080923 discloses a process which involves first reducing granulated nutritive carbohydrate sweetener for use in the composition to a particle size required for the finished product specification by various methods including milling and roll refining. Either before or after size reduction, the nutritive carbohydrate sweetener is blended with fat, i.e. cocoa butter. At this point, water is blended into the mixture so as to dissolve the ultrafines (particles below 10$\mu$m) and the angular and jagged edges of the larger particles. The mixture is then dried with the sweetener crystals acting as nuclei for recrystallisation. The result is that there is an overall reduction in surface area of up to 50 %. However, as some agglomerates now exceed the upper specified particle size limit (about 50 $\mu$m) required for ensuring the desired mouthfeel, a further size reduction step is needed. Inevitably, this creates further ultrafine particles and effectively restricts the possible reduction in fat content to about 27 % by weight.

**[0007]** In WO 94/09649, a development of the process of US Patent 5080923 involves the inclusion of an emulsifier with the water when dissolving the ultrafine particles. Also WO 94/09649 teaches the use of a preferred particle size specification wherein substantially all of the particles are between about 3 to 50 $\mu$m in size, even more preferably about 5 to 40 $\mu$m in size, and also teaches that less than 5 wt % of the particles would be below the lower limit and less than 2 wt% of the particles would be above the upper limit. Whilst such particle size distributions may be achievable by dissolving the ultrafines in water and then recrystallising and drying, we have found that it is difficult to dry the mixture following such water treatment. It is necessary to dry the composition because, if surface moisture is present on the sugar particles, the fat phase does not readily cover them. We have also found that such stringent particle size specifications are not necessary to enable manufacture of a good quality low fat chocolate.

### Description of the Invention

**[0008]** According to the present invention, there is provided a process for the manufacture of a chocolate composition having a total fat content of 18 (preferably 18.5) to 24.9 (preferably 24.5) wt%, in accordance with claim 1.

**[0009]** This particle size requirement can be achieved using conventional chocolate processing equipment without the need to use water to dissolve the ultrafine

particles.

**[0010]** The fat will normally consist of cocoa butter and/or butterfat and/or cocoa butter equivalent (CBE). CBE's are fats with a composition similar to cocoa butter, chemically and physically, normally made from non-lauric fats and currently permitted in an amount up to 5 wt% in some countries. The present invention is further applicable to compositions in which some of the cocoa butter is replaced by a partly or wholly non-metabolisable fat, for example Caprenin.

**[0011]** The chocolate composition will normally contain sugar (sucrose) as nutritive carbohydrate sweetener. For sugar-reduced or sugar-free chocolate, the sucrose may be partially or wholly replaced by one or more other nutritive sweeteners such as dextrose, glucose syrup solids, fructose, lactose or maltose. The nutritive carbohydrate sweetener may be partly or wholly replaced by one or more sugar substitutes such as sugar alcohols (eg lactitol, maltitol, isomalt, xylitol, mannitol, sorbitol, ethrythritol, preferably lactitol, maltitol, isomalt or any combination thereof); bulking agents (eg polydextrose, inulin, polyfructose, microcrystalline cellulose, preferably polydextrose); and intense sweeteners (eg aspartame, acesulfame-K, cyclamates, saccharin, sucralose, neohesperidin, dihydrochalone, alitame, stevia sweeteners, glycyrrhizin, thaumatin, preferably aspartame and/or acesulfame-K).

**[0012]** In order to improve the viscosity during processing of the chocolate composition, at least one emulsifier is included as an ingredient. Typically, such emulsifiers include lecithin derived from soya bean, safflower, corn, etc, fractionated lecithins enriched with either phosphatidyl choline, phosphatidyl ethanolamine, phosphatidyl inositol; emulsifiers derived from oats, mono- and diglycerides and their tartaric esters, monosodium phosphate derivatives of mono- and diglycerides of edible fats and oils, sorbitan monostearate, polyoxyethylene sorbitan monostearate, hydroxylated lecithin, synthetic phospholipids such as ammonium phosphatides, lactylated fatty acid esters of glycerol and propylene glycol, polyglycerol esters of fatty acids, propylene glycol mono- and diesters of fats and fatty acids. It is preferred to use at least one of soya lecithin and synthetic phospholipids such as ammonium phosphatides and polyglycerol polyricinoleate as the emulsifier.

**[0013]** Chocolate compositions manufactured in accordance with the present invention may further include flavourings, especially those traditionally associated with chocolate, such as vanilla. Other edible substances that may be present in the chocolate composition include those allowed under Council Directive 73/241/EEC of 24 July 1973 relating to cocoa and chocolate products intended for human consumption.

**[0014]** Control of the particle size at the lower end of the range in accordance with the present invention can enable the amount of fat which is bound to the particles to be reduced. For a given fat content, recipes with reduced amounts of bound fat are preferred as they result in a chocolate mass of a less viscous nature because of the higher proportion of free fat. This can be achieved by the use of low fat and/or fat-free cocoa powder and skimmed milk. The moisture content is also an important factor which influences the texture of the chocolate mass and the optimal level is desirable. A reduced moisture content can result in a less viscous texture because of the thickening effect which minor amounts of water can produce in fat-based materials. The resultant chocolate composition which includes the mixture of solid chocolate-making ingredients and said at least one fat most preferably has a moisture content of not more than about 1 wt%.

**[0015]** The chocolate composition is a plain chocolate, milk chocolate or white chocolate composition and may be moulded or extruded to form a bar (filled or solid), it may be moulded or deposited to form a solid or a filled chocolate which may be of a single mouthful size, or it may take the form of vermicelli chocolate, chocolate flakes or gianduja nut chocolate derived from any of such chocolate types. Alternatively, it may be used as a coating chocolate.

**[0016]** In the case of milk chocolate, the chocolate composition will comprise non-fat cocoa solids, fat, milk solids, nutritive carbohydrate sweetener and emulsifier. In the case of plain chocolate, the chocolate composition will comprise non-fat cocoa solids, fat, nutritive carbohydrate sweetener and emulsifier. In the case of white chocolate, the chocolate composition will comprise milk solids, fat, nutritive carbohydrate sweetener and emulsifier.

**[0017]** For the manufacture of a milk chocolate composition by means of the process according to the present invention, the base ingredients are usually (a) cocoa powder (preferably low fat, eg 11 wt% fat or lower) and/or cocoa liquor; (b) sucrose and/or dextrose and/or other permitted carbohydrates, but preferably sucrose; and (c) whole milk powder and/or any processed or part-processed milk powder such as skimmed milk powder, whey powder, milk protein concentrate, lactose, modified milk powder, yoghurt powder, but preferably skimmed milk powder and/or whole milk powder. The formulation of these ingredients depends upon the ratio of sugar: milk solids: cocoa solids desired in the final chocolate composition.

**[0018]** The chosen base ingredients are mixed in a food grade blender and then milled to meet the required particle size specification in a hammer, pin or vane mill with classifier. Plain chocolate and white chocolate compositions may be prepared in a similar way except that, in the case of plain chocolate, milk solids are not included, whereas non-fat cocoa solids are not included for white chocolate.

**[0019]** When cocoa liquor is used as a source of cocoa solids, it is preferably milled in a ball mill or roll refiner, either alone or with milk powder depending upon the type of chocolate required, to meet the desired particle size distribution specification. It is then mixed with sucrose or other sweetener which has been pre-milled to meet the

specified particle size distribution. Alternatively, some or part of the sugar or other sweetener and/or part of the milk powder can be added to the cocoa liquor before ball milling or roll refining.

**[0020]** In an alternative procedure, the ingredients may be first converted into a crumb using standard techniques known in the art. A further alternative is to prepare a full fat chocolate having a higher-than-desired fat content and then press or solvent extract it to reduce the fat content to not greater than the desired final level. The resultant material can then be cryogenically milled to meet the required particle size specification.

**[0021]** Following this, fat and any other ingredients to be incorporated can be added to complete the final formulation. At this stage, milling is required if the ingredients have been formulated into a chocolate crumb previously. Such milling is preferably effected using cryogenic cooling to meet the required particle size distribution. The same mills as mentioned above for milling the base ingredients may be employed.

The milled crumb may then be pasted with remaining fat, the emulsifier and other ingredients to produce the desired chocolate composition.

**[0022]** The resultant milled base ingredients for white, plain or milk chocolate, may then be pasted directly with any remaining fat, emulsifier and minor ingredients to give the desired chocolate composition. Milled press cake derived from pressing full fat chocolate as described above may be pasted directly with the remaining fat, emulsifier and other minor ingredients.

## Detailed Description of the Invention

**[0023]** The invention will now be described in further detail in the following Examples wherein, in all cases, the specified particle size distribution is that not more than 1 wt% of all particles exceed 60 $\mu$m and not more than 15 wt% of particles are less than 2 $\mu$m and/or not more than 20 wt% of particles are less than 3 $\mu$m.

## Example 1

**[0024]** Sugar (50 kg), skimmed milk powder (22.6 kg) and low fat (11 wt%) cocoa powder (6.1 kg) were premixed and milled at ambient temperature using a Mikro ACM classifier mill, mill speed 7000 rpm, classifier speed 3000 rpm, to a particle size distribution in which the median particle size was 7 $\mu$m and 90% of the particles ($D_{90}$) were below 24.4 $\mu$m.

**[0025]** The above milled powder (10 kg), fat content 1.14 wt% was conched for about 4 hours at speed 1 in the 10 qt (quart) bowl of a Hobart mixer jacketed at 40°C, with cocoa butter (1.75 kg) and butterfat (0.9 kg) until a thick paste was formed. Ammonium phosphatides (65 g) and polyglycerol polyricinoleate (40 g) were added and mixed until fluid.

The chocolate produced had a fat content of 22.49 wt% and was hand tempered and moulded.

## Example 2

**[0026]** Sugar (50 kg), full cream milk powder (24.5 kg), skimmed milk powder (6.6 kg) and low fat (11 wt%) cocoa powder (6.1 kg) were premixed and milled at ambient temperature using a Mikro ACM classifier mill, mill speed 7000 rpm, classifier speed 3000 rpm, to a particle size distribution in which the median particle size was 11.2 $\mu$m and $D_{90}$ = 32.5 $\mu$m. 10 kg of the above milled powder, having a fat content 8.15 wt%, was conched for about 4 hours at speed 1 in the 10 qt bowl of a Hobart mixer jacketed at 40°C with cocoa butter (1.75 kg) until a thick paste was formed. Ammonium phosphatides (60 g) and polyglycerol polyricinoleate (40 g) were added and mixed until fluid. The chocolate produced had a fat content of 22.49 wt% and was hand tempered and moulded.

## Example 3

**[0027]** 100 kg of chocolate crumb having a fat content of 16 wt% was milled using cryogenic cooling to reduce its temperature to below ambient temperature, in a Mikro ACM classifier mill, mill speed 7000 rpm, classifier speed 1000 rpm, to a particle size distribution in which the median particle size was 8.0 $\mu$m and $D_{90}$ = 21.0 $\mu$m.

10 kg of the above milled crumb was conched for about 4 hours at speed 1 in the 10 qt bowl of a Hobart mixer jacketed at 40°C, with cocoa butter (0.72 kg) until a thick paste was formed. Ammonium phosphatides (80 g) and polyglycerol polyricinoleate (40 g) were added and mixed until fluid. The chocolate produced had a fat content of 22.51 wt% and was hand tempered and moulded.

## Example 4

**[0028]** Cocoa liquor (3 kg) was milled in a ball mill to meet the specified particle size distribution. Sugar (50 kg), full cream milk powder (24.5 kg) and skimmed milk powder (6.6 kg) were individually milled in a Mikro ACM classifier mill, mill speed 7000 rpm, classifier speed 3000 rpm to a particle size distribution in which the median particle size was 8.2 $\mu$m and $D_{90}$ = 26.7 $\mu$m..

**[0029]** The milled ingredients were then mixed to make a chocolate base having a fat content of 7.94 wt%. Milled cocoa liquor (1.4 kg) and low fat chocolate base (10 kg) were conched, for about 4 hours at speed 1 in the 10 qt bowl of a Hobart mixer jacketed at 40°C with cocoa butter (250 g) and butterfat (900 g) to form a paste. Ammonium phosphatides (65 g) and polyglycerol polyricinoleate (40 g) were added and mixed until fluid. The chocolate produced had a fat content of 22.38 wt% and was hand tempered and moulded.

## Example 5

**[0030]** 5.95 kg of full fat milk chocolate (containing cocoa butter, cocoa solids, sugar and milk solids - total fat content 29 wt% fat) was pressed at 60°C in a hydraulic

press at 400 bar to remove 834 g fat. The press cake, about 17.4 wt% fat, was milled to a particle size distribution in which the median particle size was 9.5 $\mu$m and $D_{90}$ = 28.5 $\mu$m in a Mikro ACM classifier mill, mill speed 7000 rpm, classifier speed 3000 rpm, using cryogenic cooling to reduce its temperature to below ambient .

**[0031]** 5.12 kg of the milled cake was then conched with cocoa butter (0.27 kg), ammonium phosphatides (25 g) and polyglycerol polyricinoleate (40 g) for about 4 hours at speed 1 in the 10 qt bowl of a Hobart mixer jacketed at 40°C. The chocolate produced had a fat content of 22.5 wt% and was hand tempered and moulded.

## Claims

1. A process for the manufacture of a milk, white or plain chocolate composition having a total fat content of 18 to 24.9 wt%, comprising the steps of:-

   (1) intimately mixing (a) particles of solid chocolate-making ingredients comprising

   (i) in the case of milk chocolate non-fat cocoa solids, milk solids, nutritive carbohydrate sweetener and emulsifier; or
   (ii) in the case of plain chocolate non-fat cocoa solids, nutritive carbohydrate sweetener and emulsifier, or
   (iii) in the case of white chocolate milk solids, nutritive carbohydrate sweetener and emulsifier, in each case, the nutritive carbohydrate sweetener may be partially or wholly substitute by sugar substitute(s), bulking agent(s) and/or intense sweetener(s)

   , with (b) at least one fat selected from the group consisting of cocoa butter, cocoa butter equivalents and butterfat, wherein some of the cocoa butter may be replaced by partly or wholly non-metabolisable fat ;
   (2) reducing the size of said particles so that said particles have a particle size distribution, as measured by a Malvern Mastersizer, such that (a) not more than 1 wt% of said particles exceed 60 $\mu$m, and (b) not more than 15 wt% of the particles are less than 2 $\mu$m and/or not more than 20 wt% of the particles are less than 3 $\mu$m, without the addition of water to dissolve ultrafine particles; and
   (3) subjecting said mixture of solid chocolate-making ingredients and said at least one fat to a flavour development step to produce a flavour-developed chocolate composition having a total fat content of 18 to 24.9 wt%.

2. A process as claimed in claim 1, wherein the total fat content of the chocolate is 18.5 to 24.5 wt%.

3. A process as claimed in claim 1 or 2, wherein the moisture content of the mixture of solid chocolate-making ingredients and said at least one fat is not more than about 1 wt %.

4. A process as claimed in any preceding claim, wherein the solid chocolate-making ingredients are mixed in a blender and then milled to meet the required particle size specification in a hammer, pin or vane mill with classifier.

5. A process as claimed in any one of claims 1 to 3, wherein the solid chocolate-making ingredients include cocoa liquor and particulate sweetener, and wherein the cocoa liquor is milled in a ball mill or roll refiner to meet the specified particle size distribution and then mixed with at least some of said particulate sweetener which has been pre-milled to meet the specified particle size distribution.

6. A process as claimed in claim 5, wherein some of the particulate sweetener is added to the cocoa liquor before ball milling or roll refining.

7. A process as claimed in any one of claims 1 to 3, wherein at least some of the solid chocolate-making ingredients are converted into crumb form before being milled to the required particle size distribution.

8. A process as claimed in any one of claims 1 to 3, wherein a full fat chocolate having a higher-than-desired fat content is prepared and then pressed or subjected to solvent extraction to reduce the fat content to not greater than the desired final level, and then the resultant material is cryogenically milled to meet the required particle size specification.

9. A process as claimed in any preceding claim, wherein the solid chocolate-making ingredients are mixed with said at least one fat and with emulsifier to form a paste.

## Patentansprüche

1. Verfahren zur Herstellung einer schwarzen, weissen oder einer Milchschokoladenzusammensetzung mit einem totalen Fettgehalt von 18 bis 24,9 Gew.-% gemäß den folgenden Verfahrensschritten:

   (1) inniges Mischen (a) der Partikel der festen Zutaten für die Schokoladenherstellung enthaltend :

   (i) im Falle von Milchschokolade nicht fette Kakaofeststoffe, Milchfeststoffe, nahrhafte kohlenhydrathaltige Süßstoffe und Emulgierungsmittel; oder

(ii) im Falle von schwarzer Schokolade nicht fette Kakaofeststoffe, nahrhafte kohlenhydrathaltige Süßstoffe und Emulgierungsmittel; oder
(iii) im Falle von weisser Schokolade Milchfeststoffe, nahrhafte kohlenhydrathaltige Süßstoffe und Emulgierungsmittel,
in jedem Fall kann der nahrhafte kohlenhydrathaltige Süßstoff teilweise oder vollständig durch Zuckerersatzstoff(e), Füllstoff(e) und/oder intensive Süßstoff(e) ersetzt werden, mit (b) mindenstens einem Fett das ausgewählt ist aus der Gruppe bestehend aus Kakaobutter, Äquivalenten der Kakaobutter und Butterfett, worin ein Teil der Kakaobutter teilwiese oder vollständig durch nicht metabolisiertes Fett ersetzt werden kann,

(2) Verminderung der Größe der Partikel, so dass die Partikel eine Partikelgrößenverteilung aufweisen, wie sie mit dem Malvern Mastersizer gemessen wird, derart dass (a) nicht mehr als 1 Gew.-% der Partikel 60 μm überschreiten, und (b) nicht mehr als 15 Gew.-% der Partikel unter 2 μm liegen und/oder nicht mehr als 20 Gew.-% der Partikel unter 3 μm liegen, ohne den Zusatz von Wasser um die ultrafeinen Partikel aufzulösen; und
(3) die Mischung der festen Zutaten für die Schokoladenherstellung und das mindestens eine Fett werden einem Schritt zur Geschmacksentwicklung unterzogen, um eine Schokoladenzusammensetzung mit entwickeltem Geschmack herzustellen, welche einen totalen Fettgehalt von 18 bis 24,9 Gew.-% aufweist.

**2.** Verfahren nach Patentanspruch 1, gemäß welchem der totale Fettgehalt der Schokolade zwischen 18,5 und 24,5 Gew.-% liegt.

**3.** Verfahren nach Patentanspruch 1 oder 2, gemäß welchem der Feuchtigkeitsgehalt der Mischung der festen Zutaten für die Schokoladenherstellung und des besagten mindestens einen Fetts nicht mehr als ungefähr 1 Gew.-% beträgt.

**4.** Verfahren nach irgendeinem der vorhergehenden Patentansprüche, gemäß welchem die festen Zutaten für die Schokoladenherstellung in einem Mischer vermischt werden und dann in einer Hammermühle, in einer Stift- oder Flügelmühle mit einem Klassiergerät gemahlen werden, um der erforderten Spezifikation der Partikelgröße zu entsprechen.

**5.** Verfahren nach irgendeinem der Patentansprüche 1 bis 3, gemäß welchem die festen Zutaten für die Schokoladenherstellung Kakaopaste und partikelförmige Süßstoffe mit umfassen, und gemäß welchem die Kakaopaste in einer Kugelmühle oder in einem Walzenraffineur gemahlen wird, um der vorgegebenen Partikelgrößenverteilung zu entsprechen, und dann mit mindestens ein wenig des besagten partikelförmigen Süßstoffes vermischt wird, welcher vorgemahlen worden ist, um der vorgegebenen Partikelgrößenverteilung zu entsprechen.

**6.** Verfahren nach Patentanspruch 5, gemäß welchem ein wenig des partikelförmigen Süßstoffes zu der Kakaopaste hinzugegeben wird, vor der Behandlung in der Kugelmühle oder dem Walzenraffineur.

**7.** Verfahren nach irgendeinem der Patentansprüche 1 bis 3, gemäß welchem mindestens ein wenig der festen Zutaten für die Schokoladenherstellung in die Krümmelform umgewandelt wird, bevor dieselben auf die erforderte Partikelgrößenverteilung gemahlen werden.

**8.** Verfahren nach irgendeinem der Patentansprüche 1 bis 3, gemäß welchem eine Vollfettschokolade mit einem höher als gewünschten Fettgehalt zubereitet wird und dann gepresst wird oder einer Lösungsmittelextraktion unterzogen wird, um den Fettgehalt auf ein Niveau zu senken, das nicht größer ist als das gewünschte Endniveau, und dann wird das resultierende Material kryogenisch gemahlen, um der erforderten Partikelgrößenspezifikation zu entsprechen.

**9.** Verfahren gemäß irgendeinem der vorhergehenden Patentansprüche, gemäß welchem die festen Zutaten für die Schokoladenherstellung mit dem besagten mindestens einen Fett und mit Emulgierungsmitteln vermischt werden, um eine Paste zu bilden.

**Revendications**

**1.** Procédé pour la fabrication d'une composition de chocolat au lait, de chocolat blanc ou de chocolat noir avec une teneur totale en graisse de 18 à 24,9% en poids, comprenant les étapes consistant:

(1) à mélanger intimement (a) des particules d'ingrédients solides de chocolaterie comprenant

(i) dans le cas d'un chocolat au lait, des matières sèches de cacao non grasses, des matières sèches de lait, des édulcorants d'hydrates de carbone nutritifs et des émulsifiants; ou
(ii) dans le cas d'un chocolat noir, des matières sèches de cacao non grasses, des édulcorants d'hydrates de carbone nutritifs et des émulsifiants; ou

(iii) dans le cas d'un chocolat blanc, des matières sèches de lait, des édulcorants d'hydrates de carbone nutritifs et des émulsifiants,
dans tous les cas, l'édulcorant d'hydrates de carbone nutritif peut être partiellement ou totalement substitué par un (des) substitut(s) de sucre, un (des) agent(s) gonflant (s) et/ou un (des) édulcorant(s) puissant(s), avec (b) au moins une graisse choisie dans le groupe constitué de beurre de cacao, d'équivalents de beurre de cacao, de matière grasse du beurre et d'une graisse ne pouvant être métabolisée,

(2) à réduire la taille desdites particules de sorte que lesdites particules présentent une distribution de tailles de particules, mesurée par un appareil Malvern Mastersizer, telle que (a) pas plus de 1% en poids desdites particules ne dépassent 60 μm et (b) pas plus de 15% en poids des particules ne sont inférieures à 2 μm et/ou pas plus de 20% en poids des particules ne sont inférieures à 3 μm, sans ajout d'eau pour dissoudre les particules ultrafines; et
(3) à soumettre ledit mélange des ingrédients solides de chocolaterie et de ladite au moins une graisse à une étape de développement du goût pour produire une composition de chocolat à goût développé possédant une teneur totale en graisse de 18 à 24,9% en poids.

**2.** Procédé suivant la revendication 1, dans lequel la teneur totale en graisse du chocolat est de 18,5 à 24,5% en poids.

**3.** Procédé suivant la revendication 1 ou 2, dans lequel la teneur en humidité du mélange d'ingrédients solides de chocolaterie et de ladite au moins une graisse ne dépasse pas environ 1% en poids.

**4.** Procédé suivant l'une quelconque des revendications précédentes, dans lequel les ingrédients solides de chocolaterie sont mélangés dans un mélangeur et ensuite broyés pour satisfaire la spécification requise de tailles de particules dans un broyeur à marteaux, à broches ou à ailettes avec un classificateur.

**5.** Procédé suivant l'une quelconque des revendications 1 à 3, dans lequel les ingrédients solides de chocolaterie incluent de la liqueur de cacao et un édulcorant particulaire, et dans lequel la liqueur de cacao est broyée dans un broyeur à boulets ou dans un raffineur à rouleaux pour satisfaire la distribution spécifiée de tailles de particules et ensuite mélangée avec au moins une partie dudit édulcorant particulaire qui a été broyée au préalable pour satisfaire la distribution spécifiée de tailles de particules.

**6.** Procédé suivant la revendication 5, dans lequel une partie de l'édulcorant particulaire est ajoutée à la liqueur de cacao avant le broyage à boulets ou le raffinage à rouleaux.

**7.** Procédé suivant l'une quelconque des revendications 1 à 3, dans lequel au moins une partie des ingrédients solides de chocolaterie est convertie en une forme de grumeaux avant d'être broyée jusqu'à la distribution requise de tailles de particules.

**8.** Procédé suivant l'une quelconque des revendications 1 à 3, dans lequel un chocolat ayant une teneur totale en graisse présentant une teneur en graisse supérieure à la valeur désirée est préparé et ensuite pressé ou soumis à une extraction par solvant pour réduire la teneur en graisse jusqu'à une valeur ne dépassant pas le niveau final désiré et puis la matière résultante est broyée par cryogénie pour satisfaire la spécification requise de tailles de particules.

**9.** Procédé suivant l'une quelconque des revendications précédentes, dans lequel les ingrédients solides de chocolaterie sont mélangés avec ladite au moins une graisse et avec l'émulsifiant pour former une pâte.

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


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